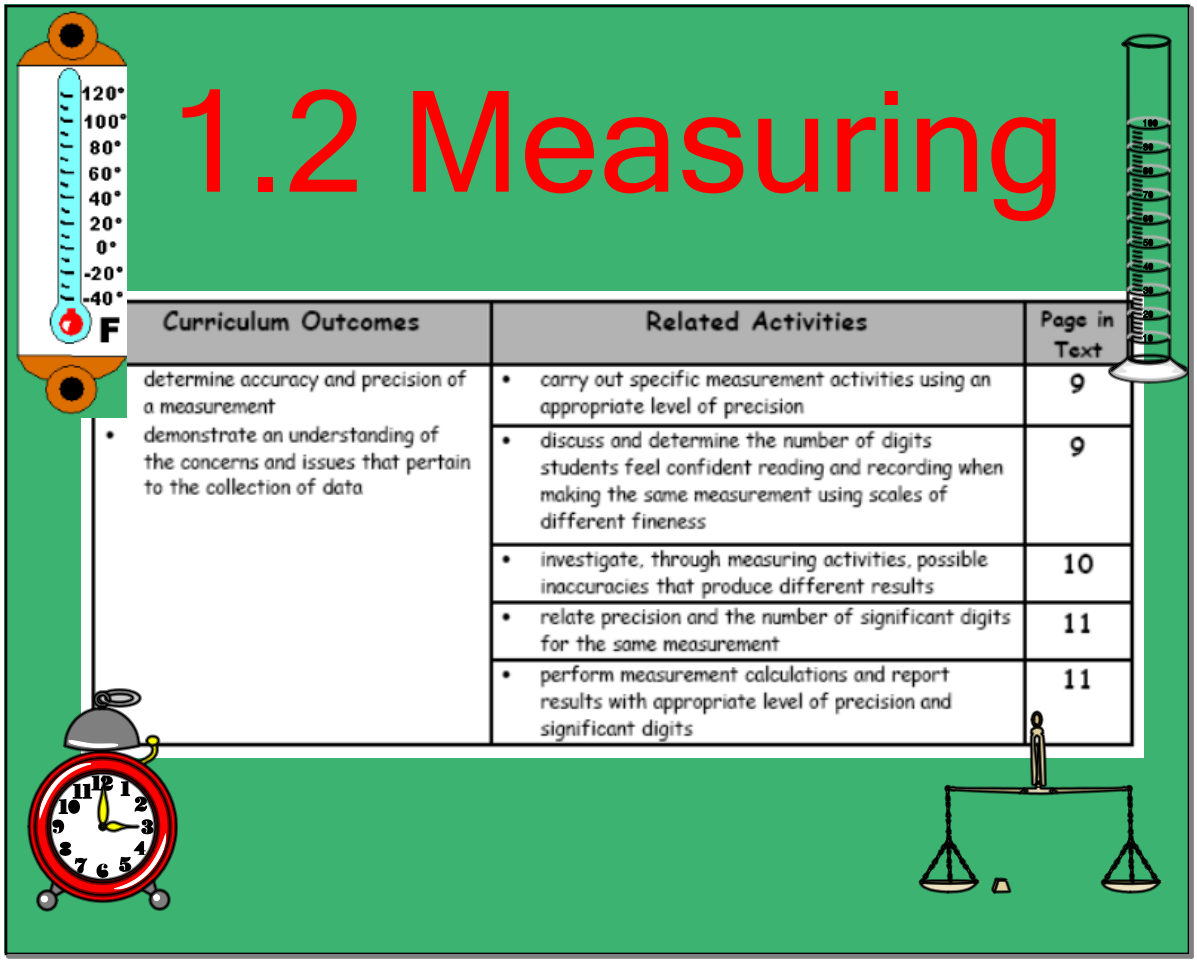
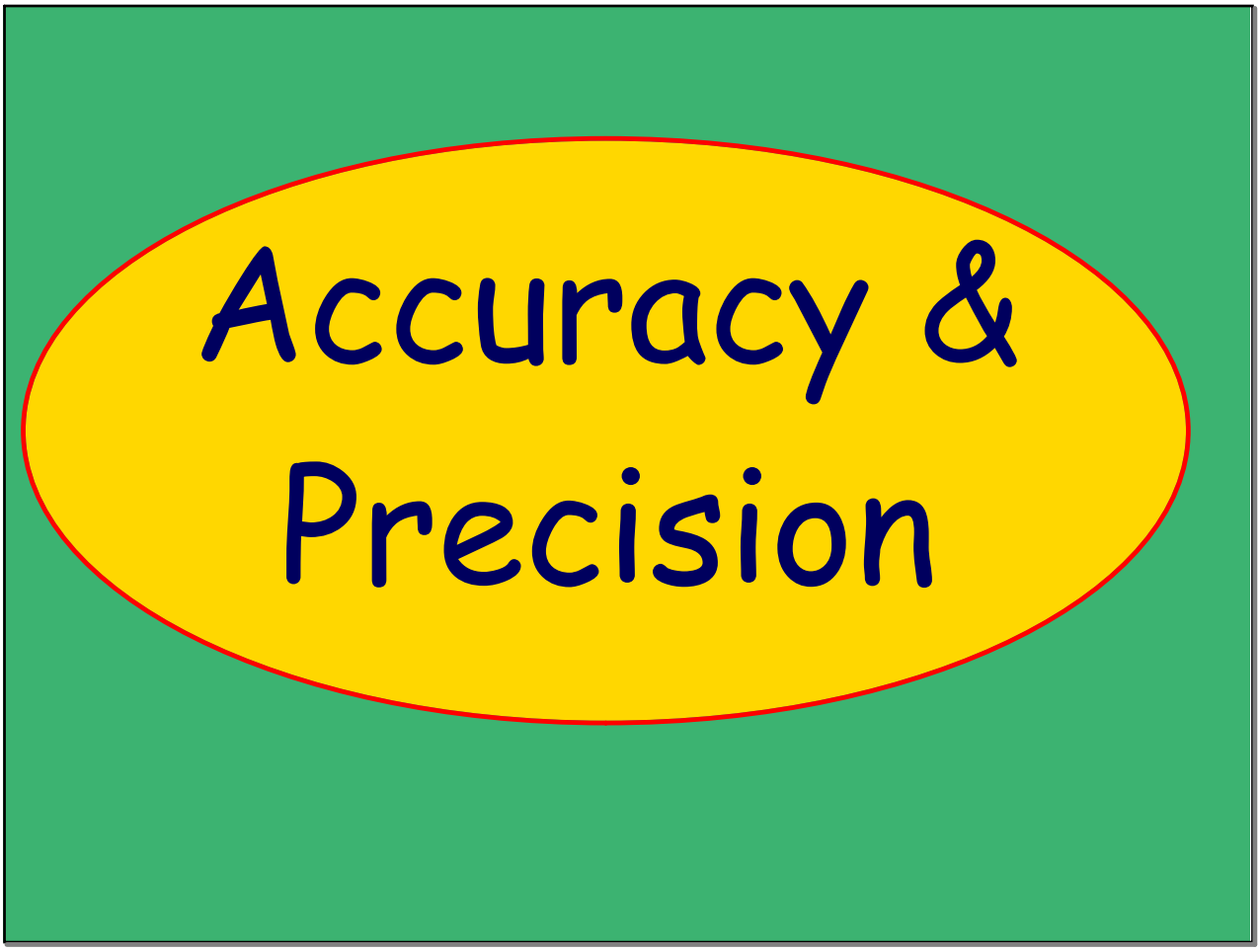

1.2 Measuring
Curriculum Outcomes
Related Activities
Page in Text
determine accuracy and precision of a measurement
demonstrate an understanding of the concerns and issues that pertain to the collection of data
carry out specific measurement activities using an appropriate level of precision
9
discuss and determine the number of digits students feel confident reading and recording when making the same measurement using scales of different fineness
9
investigate, through measuring activities, possible inaccuracies that produce different results
10
relate precision and the number of significant digits for the same measurement
11
perform measurement calculations and report results with appropriate level of precision and significant digits
11


Accuracy &
Precision

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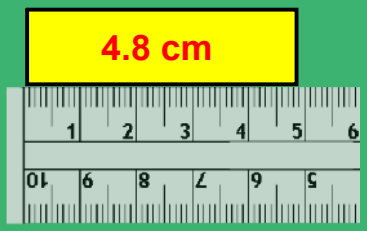
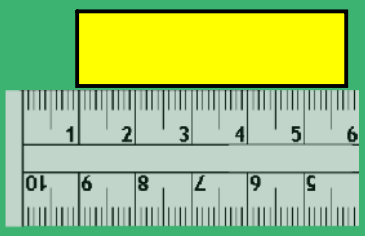
Accuracy

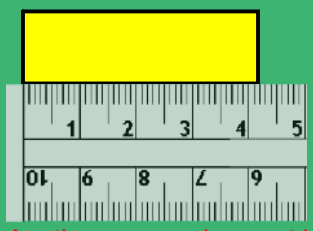
If these shapes are measured multiple times by different people, will everyone find the same measurement?



A. One person places the ruler correctly and reads the scale properly as 4.8 cm.



B. One person places the ruler and incorrectly records 5.7 cm.



C. Another person does not look straight down at the scale when reading it and records 4 cm.

Even though all three people used the same ruler, they read the measurement with different accuracy.

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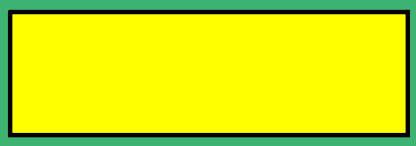
Precision

Which ruler will give us a more precise measurement of this shape?



When you use a tool to measure the quantity, the precision of the measurement depends on how fine the scale divisions are.

Copy down into notes

Accuracy vs. Precision

Accuracy: indicates how close the recorded measurement is to the true value. It is dependent upon the **user's skill** in using the measuring tool.

- People need to be accurate!

Precision: is determined by the **fineness** of the scale of a tool. The finer scale allows you to record the measurement to a greater number of digits.

- If the ruler you are using only has centimeters then you can only be as precice as the nearest centimeter (no millimeters).

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Focus B Questions:

(Page 9)

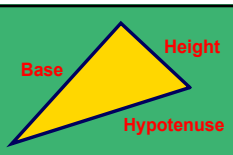
- **Why is it important to use the same tool to measure length and width of an abject when calculating area?**

It is important to measure both length and width with the same tool so that they can both have the same precision and accuracy.

- **Explain why the measurement 100.0 m is more precise than 100 m.**

100.0m is more precise because it shows one more place than 100m

Investigation 1:



Purpose: to explore precision and accuracy when measuring.

Procedure:

A. Get a ruler from the classroom materials. Create the table below in your notes.

B. Measure the length of the base, height and hypotenuse of the triangle on page 9 (use the diagram above for help). Be as accurate and precise as you can. Record in your table.

C. Get the measurements of the person beside you. Write down their measurements in the table:

	Your measurements	Their measurements
Base		
Height		
Hypotenuse		

D. Who's measurements are more accurate? Why?
Who's measurement is more precise? Why?

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(doing together)

Class Work:

Compare the tools which are illustrated on page 7 of your textbook:

1. Which tools measure time?
2. Which tool measures time more precisely?
3. Name another tool that measures time.
4. Which tools measure temperature?

5. Which measures temperature more precisely?

6. How could a person make an error in using an ear thermometer?

7. Which tool measures mass?

8. Which tool measures volume?

9. Which measures more precisely - the scale balance or the graduated cylinder?

10. How could a person make an error when using the graduate cylinder? Would this error affect the accuracy or the precisio of the measurement?

Also complete,
Pg 10 # 3 ⟶ Measure each being as accurate and precise as you can

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Significant Digits

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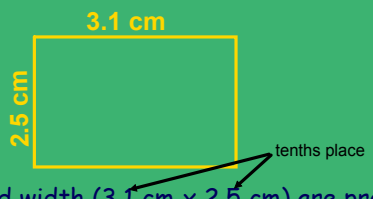
Why do we use Significant Digits?

When you do calculations involving measured values, your answer can only be as precise as the least-precise measured value.

Example:



- The length and width (3.1 cm x 2.5 cm) are precise to the tenth of a centimeter .
- If you calculate the area (A = L x W), the result is expressed in hundredths of a centimetre (7.75 cm^2).

hundredths place

$A = L \times W$
$= 3.1\ cm \times 2.5\ cm$
$= 7.75\ cm^2$

- This is a more precise measurement than the original length and width, however is not correct.

** Answered to 1 more decimal place than what has been measured. **

- **So, the area of this rectangle must be expressed as 7.8 cm^2. (7.75 rounds off to 7.8)**

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Significant Digit Laws

Significant Digits: can help you make decisions regarding the least precise measured value. This process is understood universally (meaning that all mathematicians use it).

Rules for Significant Digits

1. All nonzero digits (1,2,3,4,5,6,7,8,9) in a measurement are always significant.

Measurement (cm)	Number of Significant Digits	Measurement (cm)	Number of Significant Digits (fill in answer)
2.45	3	5.7	
34.5678	6	22391	
2.1	2	34993	
3.456	4	2.451	

2. Zeroes appearing between nonzero digits are significant.

Measurement (cm)	Number of Significant Digits	Measurement (cm)	Number of Significant Digits (fill in answer)
10001	5	100.38	
30.39	4	10.4	
12.0005	6	200005	
2.01	3	7.004	

3. Zeroes appearing in front of all nonzero digits are NOT significant.

Measurement (cm)	Number of Significant Digits	Measurement (cm)	Number of Significant Digits (fill in answer)
0.0034	2	0.000 000 000 2	
0.000 000 05	1	0.5681	
0.08734	4	0.000438	
0.00405	3	0.00091	

4. Zeros at the end of a number and to the right of the decimal point are significant.

Measurement (cm)	Number of Significant Digits	Measurement (cm)	Number of Significant Digits (fill in answer)
3.500	4	7.00	
96.0	3	872.3400	
5.000	4	48.00	
9.0	2	12.000	

5. Zeros at the end of a number which has **no** decimal point are NOT significant.

Measurement (cm)	Number of Significant Digits	Measurement (cm)	Number of Significant Digits (fill in answer)
450	2	34 000 000 000	
82450	4	8 657 480	
5 000 000	1	600	
983 000	3	32 340 000	